



MARINE MAMMAL COMMISSION

8 December 2014

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the National Science Foundation (NSF) Division of Polar Programs and Antarctic Support Contract (ASC)¹ seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted in the Ross Sea in January and February 2015. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 17 November 2014 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (79 Fed. Reg. 68512).

Some issues raised in previous Commission letters regarding similar geophysical surveys reflect ongoing concerns that apply more broadly to incidental take authorization applications, not just those from NSF and ASC. The Commission has recommended numerous times that NMFS adjust density estimates used to estimate the numbers of potential takes by incorporating some measure of uncertainty when available density data originate from other geographical areas and temporal scales² and that it formulate a policy or other guidance setting forth a consistent approach for how applicants should incorporate uncertainty in density estimates. The Commission also has recommended that NMFS follow a consistent approach in assessing the potential for taking by Level B harassment from exposure to specific types of sound sources (e.g., echosounders, sub-bottom profilers, side-scan sonar, and fish-finding sonar) by all applicants who propose to use them³. In addition, despite repeated recommendations from the Commission that it do so, NMFS has yet to develop a clear policy setting forth more explicit criteria and/or thresholds for making small numbers and negligible impact determinations. The Commission understands that NMFS is in the process of developing clearer policies and guidance to address these concerns. The Commission

¹ NSF and ASC submitted the application on behalf of Louisiana State University. NSF is funding the research, and ASC would operate the source vessel.

² Including the age of the data.

³ Please refer to the Commission's 30 January 2014 letter detailing its rationale.

welcomes the opportunity to work with NMFS as it develops these broadly applicable policies, and in making determinations specific to NSF and ASC applications.

Background

NSF and ASC propose to conduct a low-energy geophysical survey in the Ross Sea. The purpose of the proposed survey is to evaluate the timing and duration of two grounding events (i.e., advances of grounded ice) within the Whales Deep Basin in the eastern Ross Sea. The survey would be conducted in waters estimated to be 100–1,000 m in depth with approximately 1,750 km of tracklines. The R/V *Nathaniel B. Palmer* would tow a two-airgun array (nominal source level of 234 dB re 1 μ Pa at 1 m (peak) with a maximum discharge volume of 210 in³) at 3–4 m depth. The *Palmer* also would tow one or two hydrophone streamers, 100 m in length, during the survey. ASC would operate a single-beam echosounder (at 3.5 kHz for bottom-tracking and 12 kHz for sub-bottom profiling purposes), a multibeam echosounder (at 12 kHz), an acoustic Doppler current profiler (ADCP; at 150 kHz), and acoustic pingers and deploy up to 50 expendable bathythermographs throughout the survey. In addition, ASC would collect core samples using various sampling devices.

NMFS preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 18 species of marine mammals and that any impact on the affected species would be negligible. NMFS does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include (1) monitoring exclusion and buffer zones, (2) using shut-down and ramp-up procedures, and (3) speed and course alterations, if safe and practicable.

Despite repeated recommendations in previous letters and discussions regarding the Commission's concerns with NMFS, NSF, Lamont-Doherty Earth Observatory (LDEO), and U.S. Geological Survey (USGS), some major issues remain unresolved. These ongoing concerns are summarized in the following sections.

Uncertainty in modeling exclusion and buffer zones

Since 2010 the Commission has identified issues with the method used to estimate exclusion and buffer zones (based on Level A and B harassment, respectively) and the numbers of takes incidental to NSF-funded geophysical research. Briefly, LDEO performs acoustic modeling for geophysical research funded by NSF. For at least 6 years (and likely more than the last 10 years), LDEO has estimated exclusion and buffer zones using a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions (Diebold et al. 2010). As noted in the Commission's previous letters (see the Commission's 18 August 2014 letter), numerous studies⁴ have underscored the importance of incorporating site-specific environmental and operational parameters into estimating exclusion and buffer zones. The recent Crone et al. (2014)⁵ study indicated that, in shallow and sloped environments, the complexity of local geology

⁴ Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and most recently, Crone et al. (2014).

⁵ Crone et al. (2014) used hydrophone data from waters off Washington State to compare empirically derived estimates to model-estimated exclusion and buffer zones for the 36-airgun array.

and bathymetry and the typical lack of sufficient information regarding this complexity can make it difficult to predict accurately sound levels as a function of distance from the source array. In contrast to the facts in the applicable scientific literature, LDEO's model does not incorporate environmental characteristics of the specific study area, including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients. Nevertheless, LDEO continues to assert that its model generally is conservative⁶ when compared to in-situ sound propagation measurements (based primarily on measurements made in the Gulf of Mexico), a conclusion with which the Commission disagrees.

To estimate the proposed exclusion and buffer zones for the survey in the Ross Sea, LDEO used two G airguns as a proxy for two GI airguns within the Nucleus modeling software and assumed a maximum tow depth of 4 m. LDEO also used a correction factor of 1.5 to derive relevant zones for intermediate water depths from modeled deep-water results⁷. However, LDEO has not substantiated the applicability of the 1.5 correction factor in environments other than the Gulf of Mexico and has provided no evidence that the 1.5 correction factor is appropriate when using LDEO's model to estimate the relevant zones for the two G guns that will be used in the Ross Sea. LDEO indicated in other recent authorization applications that its calibration data show that, at greater distances (4 to 5 km), sound reflected from the sea floor and refracted from the sub-seafloor dominates, while the direct arrivals become weak and/or incoherent (Figures 11, 12, and 16 in Appendix H of the NSF/USGS programmatic environmental impact statement for geophysical surveys (PEIS)). LDEO stated that aside from local topography effects, the region around the critical distance (~5 km in Figures 11 and 12 and ~4 km in Figure 16 in Appendix H of the NSF/USGS PEIS) is where the observed sound levels rise very close to the mitigation model curve. Although the observed sound levels occur primarily below the mitigation model curve, that finding further substantiates the fact that the model is not necessarily representative of site-specific environmental conditions, including bathymetry and sound speed profiles. As the Commission has explained in previous letters, the reflective/refractive arrivals are the very measurements that should be accounted for in site-specific modeling and that ultimately determine underwater sound propagation.

Because LDEO has failed to verify the applicability of its model to conditions outside the Gulf of Mexico, the Commission has recommended in many of its letters that NMFS and/or applicants estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that accounts for the conditions in the proposed survey area. The model should incorporate site-specific environmental⁸ and operational⁹ parameters.

In March 2013, LDEO indicated that it might be able to compare its model to hydrophone data collected during previous surveys in environmental conditions other than those in the Gulf of Mexico (i.e., deep and intermediate waters in cold-water environments that may have surface ducting conditions, shallow-water environments, etc.). The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington State to allow comparisons of empirically

⁶ It overestimates the distances to the various thresholds.

⁷ Based on past practice and empirical measurements from the 36-airgun array in the Gulf of Mexico from Diebold et al. (2010).

⁸ Such as sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed.

⁹ Such as tow depth, source level, number/spacing of active airguns.

derived estimates to model-estimated exclusion and buffer zones. Crone et al. (2014) indicated that the zones can be reliably established with the hydrophone streamer only in shallow water, perhaps in depths no greater than about 200 m. They also stated that additional investigations into the use of hydrophone data for the determination of sound power levels from previous surveys, and perhaps new targeted calibration experiments, could help refine the effects of water depth and seafloor slope on power levels measured with the streamer in intermediate-depth waters and provide more concrete guidelines on the depth ranges for which the streamer can be reliably used for sound power level estimates¹⁰. Further, Crone et al. (2014) indicated that the modeled zones were greater than the measured zones in waters 200 m or less, which could be due to differences in bottom and sub-bottom properties between the Washington and the Gulf of Mexico sites—some of the very factors that the Commission believes should be included in the model.

The Commission is pleased that LDEO has analyzed hydrophone data from waters off Washington State to compare empirically measured to model-estimated exclusion and buffer zones. However, LDEO would need to make such comparisons at various sites, not just in waters off Washington, if it intends to continue using a model that does not incorporate site-specific parameters. The Commission stands by its recommendations in its 24 June 2013 letter that such comparisons be made and the results incorporated in any incidental harassment applications for geophysical surveys to be conducted in 2014. The Commission further recommended that, if LDEO and NSF either do not have enough data to compare LDEO's modeled results to other environments, or choose not to assess the accuracy of the model, then they should re-estimate the exclusion and buffer zones and associated takes of marine mammals using site-specific environmental parameters (including sound speed profiles, bathymetry, and bottom characteristics) for all future applications that use LDEO's model. Neither approach was used for any of the proposed incidental harassment authorizations in 2014, including the currently proposed authorization.

In addition, the Commission disagrees with NMFS's conclusion that NSF, LDEO, and other relevant entities (USGS, Scripps Institution of Oceanography (Scripps)) are providing sufficient scientific justification for their take estimates, given the continued use of LDEO's simplistic model and various correction factors that are not grounded in rigorous science. This is particularly true for the environmental conditions in the Antarctic survey area¹¹, which should include sound speed profiles that represent cold-water conditions (increased sound speeds), surface ducts, and in-water refraction, as well as bathymetry and sediment characteristics that reflect sound. None of these parameters are accounted for in LDEO's model. Given NSF's and LDEO's participation in the January 2014 sound exposure modeling workshop¹² at which experts confirmed that sound speed profiles and bathymetry/sediment characteristics were the most important factors affecting underwater sound propagation and should be included in related modeling, this is a deficiency that the Commission expects the applicants to take more seriously.

For all of these reasons, the Commission remains concerned that the LDEO model is not based on the best available science and does not support its continued use. Therefore, the

¹⁰ Moreover, hydrophone streamers measure power levels in one direction (behind the vessel) only. Previous studies have indicated that power levels vary as a function of azimuth.

¹¹ Which differ substantially from warm- or temperate-water regions where LDEO normally operates.

¹² Which was held in Washington, DC, and was attended by NMFS, the Commission, and USGS as well.

Commission recommends that NMFS (1) require NSF and ASC to have LDEO re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific environmental (including sound speed profiles, bathymetry, and sediment characteristics at a minimum) and operational (including number/type of airguns, tow depth) parameters for the proposed incidental harassment authorization and (2) impose the same requirements for all future incidental harassment authorizations submitted by NSF, ASC, LDEO, USGS, Scripps, or any other relevant entity. This is something that other applicants (the Navy, Air Force, Bureau of Ocean Energy Management, oil and gas industry, etc.) have done and continue to provide. The Commission believes that LDEO, NSF, and related entities (ASC, USGS, Scripps) should be held to that same standard.

NMFS recently indicated that it does not prescribe the use of any particular modeling package and does not believe it is appropriate for it to do so (79 Fed. Reg. 38499). The Commission agrees that NMFS should not instruct applicants to use specific contractors or modeling packages, but it should strive to use the best available science in conducting its analyses and reviews. At the absolute minimum, applicants need to submit sufficient information to demonstrate that the applicable requirements for obtaining an incidental harassment authorization have been met. The Commission does not believe that wholesale application of a model based on information from one area applied to another with very different environments, particularly one that ignores site-specific environmental and operational parameters, meets this standard.

Monitoring measures

In previous letters, the Commission has indicated that monitoring and reporting requirements under section 101(a)(5) of the MMPA need to be sufficient to provide a reasonably accurate assessment of the manner of taking and the numbers of animals taken incidental to the specified activity. A key goal of monitoring and reporting should be to verify that the assessments and assumptions underlying the issuance of the authorization were correct and to confirm that only small numbers of marine mammals are being taken and that the impacts are negligible. The Commission continues to believe those assessments need to account for all animals in the project area, including those at the surface but not detected and those underwater and not available for sighting, which are accounted for by $g(0)$ and $f(0)$ values. NMFS's recent responses to the Commission's comments suggested that the applicable implementing regulations require that monitoring be designed only to provide "an increased knowledge of the species [and] the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities" In NMFS's view, this increased knowledge of the level of taking could be qualitative or relative in nature, or it could be more directly quantitative (79 Fed. Reg. 38503).

The Commission continues to believe that the best interpretation of the applicable regulations is that the monitoring and reporting requirements be sufficient to provide reasonably accurate information on the level of taking and/or the impacts on the affected populations. Such an interpretation is consistent with the underlying statutory purposes monitoring and reporting requirements, which should do more than just incrementally advance our knowledge of the species. Rather, it should be designed to provide adequate information to assess whether the issuance criteria are in fact being met. From this perspective, the correct interpretation of the provision is that the applicant should propose monitoring and reporting measures that will (1) increase knowledge regarding the species (and how it might be affected by the activities causing the taking) and (2)

provide the relevant information regarding the types and levels of incidental taking that occur and the impacts of such taking on the affected marine mammal populations. Such an interpretation is consistent with the statutory structure, which under section 101(a)(5)(D)(iv) requires that NMFS “modify, suspend, or revoke an authorization” if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers of marine mammals are being taken.

NMFS has incorrectly characterized the Commission’s past comments as advocating that monitoring conducted by an authorized entity always be sufficient to quantify “the exact number of takes” that occurred during the action (79 Fed. Reg. 60817). While that may be the ideal, the Commission recognizes that it cannot be achieved regularly in practice. Nevertheless, the Commission believes that NMFS should design monitoring and reporting requirements that provide considerably more than rough, qualitative information. The specified monitoring and reporting requirements need to be sufficient to provide reasonably accurate information on the numbers of marine mammals being taken and the manner in which they are taken, not merely better information on the qualitative nature of the impacts.

Specifically for those geophysical surveys conducted in 2013 (most of which were funded by NSF) for which monitoring reports have been made available, the contractors stated that the numbers of takes observed very likely were underestimates and provided the absolute minimum number of animals actually exposed. They noted that some animals were likely not seen or had moved away before being observed. In addition to observations missed during nighttime hours, the entire Level B harassment zone was not visible on several occasions due to fog during daytime hours. Accordingly, the Commission reiterates its assertion that appropriate $g(0)$ and $f(0)$ values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. To be applicable for the proposed survey, the correction factors should be based on the ability of protected species observers to detect marine mammals rather than on hypothetically optimal estimates derived from scientific surveys (e.g., from NMFS’s shipboard abundance surveys).

Therefore, the Commission again recommends that NMFS consult with NSF, ASC, and other relevant entities (e.g., LDEO, USGS, Scripps) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and reliable estimates of the numbers of marine mammals taken by incorporating applicable $g(0)$ and $f(0)$ values. NMFS recently stated that it does not generally believe that post-activity take estimates using $f(0)$ and $g(0)$ are *required* to meet the monitoring requirement of the MMPA in the context of the NSF and LDEO monitoring plan. However, NMFS did agree that developing and incorporating a way to better interpret the results of their monitoring (perhaps a simplified or generalized version of $g(0)$ and $f(0)$) is a good idea. NMFS further stated that it would consult with the Commission and NMFS scientists prior to finalizing the recommendations (79 Fed. Reg. 38503). The Commission welcomes a meeting to further that goal.

The Commission looks forward to collaborating with NMFS on the various guidance documents and issues raised in this letter. Please contact me if you have questions concerning the Commission's recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

Cc: Holly Smith, National Science Foundation
Helene Carton, Lamont-Doherty Earth Observatory

References

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